CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

RESOLUTION NO. 94-086

POLICY ON THE USE OF WASTEWATER TO CREATE, RESTORE, AND/OR ENHANCE WETLANDS

I. WHEREAS, the Water Quality Control Plan for the San Francisco Bay Basin prohibits the discharge of wastewater which has particular characteristics of concern to beneficial uses at any point where the wastewater does not receive a minimum initial dilution of at least 10:1 and into any nontidal water or dead-end slough or similar confined water area; and

II. WHEREAS, the Water Quality Control Plan provides for exceptions to the above prohibition where an equivalent level of environmental protection can be achieved, the discharge is approved as a part of a reclamation project, or where it can be demonstrated that net environmental benefits will be derived as a result of the discharge; and

III. WHEREAS, the Regional Board has previously formulated a policy on this matter under Resolution No. 77-1; and

IV. WHEREAS, exceptions to the above prohibition have been granted under Resolution No. 77-1 based on the use of wastewater to create new wetlands and/or enhance existing wetlands; and

V. WHEREAS, new evidence regarding the use of wastewater for wetlands creation has compelled the Regional Board to revise Resolution No. 77-1; and

VI. WHEREAS, the revised policy incorporates new provisions which address issues of mitigation, the enhancement or restoration of existing wetlands, and wetlands functions and values; and amended provisions pertaining to waste discharge prohibition exceptions, waters of the United States, wetland pollution, and monitoring; and

VII. WHEREAS, the Regional Board prepared an initial study and environmental checklist evaluating significant environmental impacts in compliance with Division 13 of the Public Resource Code - California Environmental Quality Act (CEQA) - and found that no significant adverse environmental impacts would result from implementation of the revised policy, and subsequently prepared a negative declaration; and

VIII. WHEREAS, the Regional Board concludes that this revised policy involves "no potential for adverse effect, either individually or cumulatively on wildlife", and is therefore exempt from Department of Fish and Game CEQA filing fees; and

IX. WHEREAS, on July 20, 1994 this Board held a public hearing and heard and considered all comments pertaining to this matter; and

X. WHEREAS, upon consideration of the initial study, environmental checklist and comments received, the Regional Board finds that there is no substantial evidence that the project will have a significant effect on the environment.

XI. THEREFORE, BE IT RESOLVED that:

1. This Regional Board approves the CEQA negative declaration.

2. This Regional Board adopts the policy set forth in the attached document entitled "Policy on the Use of Wastewater to Create, Restore, and/or Enhance Wetlands."

XII. BE IT FURTHER RESOLVED that Resolution No. 77-1 is rescinded and those wetlands that received coverage under Resolution No. 77-1 are hereby covered under this revised policy.

XIII. BE IT EVEN FURTHER RESOLVED that:

1. The State Water Resources Control Board (State Board) is requested to approve the revised policy in accordance with Section 13245.5 of the California Water Code.

2. Upon approval, the State Board is requested to transmit the revised policy to the Office of Administrative Law for approval.

3. The Regional Board directs the Executive Officer to sign and file a Certificate of Fee Exemption with the Department of Fish and Game for this revised policy.

I, Steven R. Ritchie, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on July 20, 1994.

Jing-chung Wu

for Steven R. Ritchie
Executive Officer

POLICY ON THE USE OF WASTEWATER TO CREATE, RESTORE, AND/OR ENHANCE WETLANDS

Background

On February 15, 1977 the Regional Board adopted the "Policy and Guidelines on the Use of Wastewater to Create, Restore, Maintain, and/or Enhance Marshlands." Developments in wetlands science since 1977 and evidence gathered from existing projects have raised new questions regarding wetlands and wastewater treatment. The revised Resolution No. 94-086 adopted on July 20, 1994 updates the original 1977 Policy and rescinds Resolution No. 77-1.

The Water Quality Control Plan for the San Francisco Bay Basin (December, 1986, IV-8), hereafter called the Basin Plan, contains the following waste discharge prohibition:

> "It shall be prohibited to discharge:
>
> 1. *Any wastewater which has particular characteristics of concern to beneficial uses at any point at which the wastewater does not receive a minimum initial dilution of at least 10:1, or into any nontidal water, dead end slough, similar confined waters, or any immediate tributaries thereof.*"

This prohibition is subject to the following exceptions (IV-8):

> Exceptions will be considered for discharges where:
>
> a. "an inordinate burden would be placed on the discharger relative to beneficial uses protected and an equivalent level of environmental protection can be achieved by alternate means, such as an alternative discharge site, a higher level of treatment, and/or improved treatment reliability;
>
> or
>
> b. a discharge is approved as part of a reclamation project;
>
> or
>
> c. it can be demonstrated that net environmental benefits will be derived as a result of the discharge."

Exceptions to the above prohibition for wetland "reclamation" or wetland creation projects have previously been granted and new proposals have been made under Resolution No. 77-1. These projects involve the use of wastewater to either create new wetlands or, in some cases, to enhance or restore existing wetlands. Projects previously subject to the provisions of Resolution No. 77-1 include Mt. View Sanitary District, ITT Marsh in Palo Alto, and Hayward Marsh. These three projects will be covered, or "grandfathered," under this policy provided that each project's management plan is updated in accordance with this policy prior to the next NPDES permit reissuance for each site.

Preamble

The provisions which follow are intended to provide Regional Board policy on the implementation of the exception provisions of the Basin Plan waste discharge prohibition. It is not the intent of this policy to either encourage or discourage the use of wastewater to create, restore, and/or enhance wetlands. This policy may be modified to be consistent with ongoing regional wetlands planning efforts.

Inherent in this policy is the recognition of the beneficial aspects of wetlands. When the policy calls for the demonstration of net environmental benefits from a discharge to a wetland, it is not calling for a demonstration that wetlands are beneficial. What is being called for is a demonstration to the satisfaction of the Regional Board that the proposed discharge will be of such quality and managed in such a manner so that a beneficial wetland is in fact created. The principal form of such demonstration will be a management plan which provides detailed information on how compliance with the policy will be achieved.

For the purposes of this policy, wetlands are defined in 40 CFR Part 122.2 as:

> "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and riparian areas.

POLICY

The following provisions will be followed by the Regional Board in determining whether or not to approve projects involving the use of wastewater to create, restore, and/or enhance wetlands.

1. In order to be granted an exception to the Water Quality Control Plan waste discharge prohibition, a discharger must demonstrate that a net environmental benefit will be derived as a result of the discharge.

   Rationale: The Water Quality Control Plan provides three cases under which exceptions to the waste discharge prohibition may be granted:

   a. The discharge is approved based upon the demonstration that an equivalent level of environmental protection can be achieved.

   b. The discharge is approved as part of a reclamation project.

   c. The discharge is approved based upon the demonstration that a net environmental benefit will be derived as a result of the discharge.

   Of the three exceptions to the waste discharge prohibition, net environmental benefit will apply. Examination of the exceptions provides the rationale for net environmental benefit under this policy:

Under case a, the establishment of an equivalent level of protection is intended to ensure that the discharge will not degrade the receiving water. Proposals which fall under the terms of this policy, however, involve not only the protection of receiving waters, but also the creation of new waters of the United States. The wetland must establish new beneficial uses, these beneficial uses must be protected, and net environmental benefit must be demonstrated.

When this prohibition was first adopted by the Regional Board the typical reclamation project (as in case b) involved the use of reclaimed water to replace the use of better quality water such as potable water. Another type of reclamation is the creation or restoration of beneficial uses, particularly fish and wildlife uses. It is implied in this definition of reclamation that a net environmental benefit will result from the discharge. Therefore, if the use of wastewater to create new wetlands is considered to be a reclamation project, it is still subject to the test of demonstration of net environmental benefit.

Under case c it is clear that the demonstration of net environmental benefit will be the guiding criteria.

2. In order to demonstrate net environmental benefit, it will be necessary for the applicant to demonstrate that (1) full and uninterrupted protection will be given to all beneficial uses which could be made of the receiving water, including groundwater, in the absence of wastewater discharges and (2) that new beneficial uses will result from wetland creation, or, in rare cases, fuller realization of existing or potential uses will result from wetland restoration or enhancement beyond that which would occur in the absence of point source discharges.

Rationale: Exceptions to the waste discharge prohibition are based on the establishment of a net environmental *benefit*. To achieve a net environmental benefit, (1) the discharge cannot degrade the site with respect to conditions which existed previous to the discharge, and (2) the site must be improved. The best method to demonstrate this is through the preservation and creation of beneficial uses.

3. The Regional Board will consider exceptions to the waste discharge prohibition in cases where the wetlands are constructed systems. Generally, this policy will not permit the enhancement or restoration of existing wetlands with wastewater. In exceptional cases, enhancement or restoration of existing wetlands may be considered. However, the discharger will be required to demonstrate that the existing wetlands are unlikely to be restored by other means, and that the resulting discharge to the wetland will both maintain existing beneficial uses and create new beneficial uses. In no cases will the Regional Board consider the use of existing wetlands as treatment systems.

Rationale: Wetland enhancement projects have been proposed as environmental benefits. Discharges to existing wetlands, however, may disrupt the habitat of valuable or rare or endangered species, or may adversely alter the distribution of vegetation. Damage to existing wetlands would constitute a net loss to the Bay system and a violation of the no net loss policy. For these reasons, discharges to existing wetlands will only be considered in rare cases when the

applicant presents sufficient evidence that existing beneficial uses will be protected and new beneficial uses will be created. In addition, conversions of existing wetlands (e.g., from saltwater to freshwater) will not constitute a net environmental benefit under this policy unless these conversions meet the requirements of the Clean Water Act and the Porter-Cologne Water Quality Control Act, and are consistent with ongoing regional wetlands planning efforts.

In cases where discharges to existing wetlands are under consideration, the applicant will be required to consult with additional agencies regarding the existing wetlands prior to submitting the exception request to the Regional Board. These agencies include the State Department of Fish and Game, the State Department of Health, local vector control agencies, the Soil Conservation Service, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, and the U.S. Army Corps of Engineers. Comments received from these agencies must be submitted at the time the exception request is considered.

4. Wetlands created using wastewater shall be considered on a case-by-case basis to determine whether they are waters of the United States, as defined in 40 CFR Part 122.2, or treatment systems. Should portions of the wetland be determined to be treatment systems, the portions of the wetland that are designated waters of the United States will be the sole determinants of the net environmental benefit derived from the discharge. Portions of the wetland that are designated waters of the United States will be subject to Basin Plan water quality objectives. Portions of the wetland that are upstream of the point of compliance - and therefore part of the treatment process - will be subject to the best management practices specified in the NPDES permit. In all cases, the wetland system, consisting of treatment and nontreatment portions, will be subject to conditions specified in the NPDES permit or waste discharge requirements.

Rationale: In most cases, full protection of the beneficial uses of the wetland will be necessary to demonstrate the net environmental benefit and to warrant the exception to the waste discharge prohibition. The best regulatory tool available to the Regional Board to assure that full protection is provided is the establishment of waste discharge requirements on the discharge prior to discharge to the wetland. In some cases, a portion of the wetland may be considered to be primarily for treatment purposes. In these cases, the location of the point of compliance will be specified in the waste discharge requirements issued by the Regional Board.

Portions of the wetland which are waste treatment systems will not be subject to Basin Plan water quality objectives, and will not be assumed to create or maintain any benefit other than treatment. In these cases, the discharger will be required to employ best management practices. Portions of the wetland created, restored, or enhanced to demonstrate a net environmental benefit, and which are waters of the United States, will be subject to Clean Water Act Sections 401 and 404, Basin Plan water quality objectives, and any other applicable regulations.

5. The Regional Board will require that the maximum benefit be derived from the quantity and quality of water that is available.

Rationale: The Water Quality Control Plan discharge prohibitions were developed to lower the risk involved with waste discharges. Inherent in the granting of an exception to one of these prohibitions is a trade-off between the environmental benefit gained and the additional risk involved with discharge due to the lack of dilution relative to a deep water discharge, and generally greater ecological sensitivity of the shallow waters, inter-tidal zones, and wetlands of the Bay system. Maximizing the benefit derived will make this trade-off as favorable as possible. The final determination as to what constitutes maximum benefit will be made by the Regional Board at the time the exception request is considered and after full public hearing and consideration of the comments of all interested parties.

6. The Regional Board will require the applicant to demonstrate (1) a commitment of an adequate amount of land to make optimum use of the water to be committed to wetland creation, restoration and/or enhancement, (2) a commitment to manage the wetland to provide for maximum environmental benefit with a minimum of adverse conditions, and (3) the availability of acceptable reclamation or disposal facilities for any wastewaters not committed to wetland creation, restoration, or enhancement.

Rationale: Wetland creation projects have been proposed in many cases as an alternative to joining a subregional wastewater system and/or constructing a deep water outfall. Long term commitments are necessary in order to assure that the conditions necessary to obtain an exception to the waste discharge prohibition are maintained. The intent of this policy is to assure that adequate land and management resources are available for as long as the wastewater is intended to be used for wetland purposes. The commitment to provide the land and management resources may come from a person or persons other than the discharger but the commitment must be such that the land or management resources cannot be withdrawn without Regional Board notification. Requests for withdrawal of resources must include assessment of the protection of existing beneficial uses, and sufficient advance notice to provide for acceptable disposal or reclamation facilities for the wastewater pursuant to Basin Plan waste discharge requirements.

7. The Regional Board will require the applicant to demonstrate that the wetland will be managed so as not to create vector problems and nuisance, and so as to minimize the occurrence of avian botulism and other infectious diseases. The Regional Board will also require demonstration in the form of detailed monitoring that pollutants and other substances transferred to the wetland do not harm wildlife due to direct toxicity or bioaccumulation in the food chain. This provision applies to the entire wetland system, including sections dedicated to treatment as well as sections dedicated to demonstration of a net environmental benefit.

Rationale: As most sewage treatment plants are in or near urban areas, it is likely that most areas considered for wetland creation, restoration, and enhancement will also be near urban areas. Control of vectors and other nuisance factors is

essential in all cases and is critical near urban areas.

Wetlands may trap nutrients, toxics, and metals (e.g., mercury and selenium) which potentially accumulate and/or biomagnify in sediments and biotic tissues. Currently, there is a general lack of knowledge on how these substances and their accumulation affect wetlands and resident wildlife. In light of this information gap, a conservative approach should be used in evaluating the potential for adverse impacts to wildlife, particularly for substances that biomagnify. Detailed monitoring and contingency plans are necessary to avoid the creation of polluted wetlands and long-term adverse ecological effects.

8. The project design should consider the most important functions and values to create in order to demonstrate a net environmental benefit. Priority will be given to proposals which reflect, to the greatest extent feasible, the wetland types which were historically present at the site or are consistent with ongoing regional wetlands planning efforts. Wetlands created, restored or enhanced as exceptions to the waste discharge prohibition should not be based on the most convenient wetland type available due to financial or land area limitations.

Rationale: Existing projects designed under Resolution No. 77-1 were often implemented in ways that minimized maintenance requirements and costs, and failed to maximize habitat values. The most common result of this practice was the creation of open water areas or "ponds" fringed by steep banks and wetland vegetation. These open water areas are not representative of wetland types common to the Region, may constitute a conversion from historical wetland types, and are limited in wetland functions and values. Careful assessment of the wetland functions and values to be created is therefore required in order to determine the net environmental benefit of the proposed wetland.

9. Generally, dischargers that are granted an exception to the Water Quality Control Plan waste discharge prohibition based on the creation, restoration or enhancement of wetlands may not use these wetlands to satisfy mitigation requirements pursuant to any program within the purview of the Regional Board including, but not limited to, Sections 401 and 404 of the Clean Water Act, or any other regional or local jurisdiction. In exceptional cases, mitigation projects with wastewater may be considered. However, the applicant must demonstrate that the project is primarily a mitigation project, and not solely an effort to obtain an exception to the waste discharge prohibition. In addition, mitigation wetlands are waters of the United States and, as such, all discharges of water to the wetland must meet Basin Plan shallow water effluent limits. Mitigation projects approved under this policy by the Regional Board will be for wetland creation rather than restoration or enhancement unless the applicant fulfills requirements of Provision 3 for modification of an existing wetland.

Rationale: Under this policy, wetlands are created, restored or enhanced in order to obtain an exception to the waste discharge prohibition. In effect, the creation of a net environmental benefit is mitigatory. To count these wetlands once again for fill and development mitigation would constitute "dual credit." Therefore, there will generally be no substitution of wetlands created, restored or enhanced to obtain an exception to the waste discharge prohibition for

wetlands required as Section 404 mitigation.

The Regional Board recognizes that mitigation cases may arise where wastewater is the sole (or only appropriate) source of water. These projects would require an exception to the waste discharge prohibition by default, unless the discharge to the mitigation wetland met the 10:1 dilution requirement. This policy may be one means of acquiring the necessary exception provided that the wastewater discharged to the mitigation wetland met Basin Plan shallow water effluent limits. Prior to approval of such an exception, the applicant must contact all agencies requiring or supervising the mitigation project (e.g., the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service etc.) and submit their comments to the Regional Board.

10. Pilot investigations will be required to determine the information necessary to develop a functional wetland unless the applicant can provide the information without such investigations. The necessity for pilot work, however, will not be allowed to interfere with the implementation of necessary wastewater facilities programs. In those cases where pilot work would unduly delay a facilities planning effort, wetland creation must be considered as a "second phase" and work must proceed on disposal alternatives as the first phase. In all cases where pilot work is being performed, options for disposal must be kept open in case the wetland creation project is not approved. The information to be provided will be determined by the Executive Officer of the Regional Board in cooperation with agencies designated in Provision 11.

Rationale: Pilot work will probably be necessary in most cases to determine the optimum land area and management techniques and to provide data to assess the impacts of discharge from the proposed wetland on adjacent waters. Such pilot work may require several years for completion. In many cases such delays cannot be allowed due to the immediacy of the water quality control problem.

11. Prior to granting an exception to the Water Quality Control Plan waste discharge prohibition, the Regional Board will require the applicant to develop a management plan acceptable to the Executive Officer that provides detailed information on how compliance with provisions 1 through 10 is to be achieved. The management plan should contain the following information, at a minimum:

A. A facility plan, including a description of: the treatment works prior to discharge to the wetland; the physical facilities to be provided in the wetland area; the physical layout of the wetland including all points of discharge to and from the wetland; adjacent waters; available disposal alternatives (if any); and how the land is to be committed to this use. The facility plan must also include an explanation of the project purpose and objectives, a description of site selection and sampling, and a description of planning and design elements, including wetland design criteria.

B. An operations and maintenance plan, including a vector control program and system contingency plans.

C. As part of the operations and maintenance plan, a detailed monitoring plan to monitor parameters such as pollutants, habitat diversity, wildlife use, and vector populations.

D. A description of the anticipated water quality impacts of the proposed project including the anticipated quality of the discharge to the wetland; the anticipated quality of water in the wetland; the anticipated quantity and quality of water discharged from the wetland; and the anticipated impact of that discharge on adjacent waters. This description should include a summary of the results of any pilot work or other data on which the proposal is based.

Rationale: A management plan, in addition to providing the necessary information to the Regional Board, will provide an "operations manual" for the discharger's use in managing the wetland. Project objectives specified in the management plan will later serve as indicators of the success of the project.

Management plans should be prepared in consultation with staff of the Regional Board, the State Department of Fish and Game, the State Department of Health, local vector control agencies, the Soil Conservation Service, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, and the U.S. Army Corps of Engineers. Regional Board staff will provide the applicant with management plan recommendations.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

POLICY ON THE USE OF WASTEWATER TO CREATE, RESTORE, AND/OR ENHANCE WETLANDS

Resolution 94-086 Staff Management Plan Recommendations

I. Introduction

Under Resolution 94-086, provision 11, dischargers applying for an exception to the Water Quality Control Plan waste discharge prohibition must submit a management plan to the Regional Board. The management plan should provide detailed information on how compliance with provisions 1 through 10 of the Resolution will be achieved. This management plan, in addition to providing the necessary information to the Regional Board, will serve as an "operations manual" for the discharger's use in managing the wetland. Attainment of project objectives specified in the management plan will later serve as indicators of the success of the project.

The management plan should be prepared in consultations with the staff of the Regional Board, the State Department of Fish and Game, the State Department of Health, local vector control agencies, the Soil Conservation Service, the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, and the U.S. Army Corps of Engineers. Other relevant agencies or parties should be consulted as appropriate.

A proposed management plan must be submitted with the initial application for an exception under Resolution 94-086. The proposed management plan should be modified as needed as additional information becomes available through the pilot study, project planning, and design phases. A final management plan should be submitted prior to project construction. Any subsequent modifications to the management plan must be submitted to the Regional Board for approval by the Executive Officer.

In accordance with provision 11 of Resolution 94-086, the management plan must contain at least:

A. A facility plan,
B. An operations and maintenance plan,
C. A monitoring program, and
D. An assessment of anticipated water quality impacts, including a summary of results of any pilot work.

Recommendations follow for the topics to be included and/or considered in each of the sections of the management plan listed above. These recommendations are not intended to be comprehensive. At the time of application, the Regional Board will determine if more information is required.

II. Recommendations

A. FACILITY PLAN

The facility plan should be similar to that required for construction of a wastewater treatment facility. Provision 11.A of the Resolution specifies two subsets of requirements for the facility plan. The first subset of requirements are standard facility plan elements and include a description of 1) the treatment works prior to the discharge to the wetland; 2) the physical facilities to be provided in the wetland area; 3) the physical layout of the constructed wetland and all points of discharge to and from the wetland; 4) adjacent waters; 5) disposal alternatives (if any); and 6) how the land is to be committed to this use. Several guides for preparing these elements of a facility plan are available (see pages 7-8, references 4-7), and the procedures may be easily adapted to this application.

The second subset of provision 11.A requirements contains elements unique to development of a wastewater wetland and the establishment of a net environmental benefit. These requirements consist of a description of 1) project purpose; 2) project objectives; 3) site selection; 4) site sampling; 5) planning and design elements; and 6) wetland design criteria. Recommendations for each of the second set of elements follow:

1. Project Purpose

The purpose of the proposed wetland project should be described. If the purpose of the project is to obtain an exception to the waste discharge prohibition, the conditions leading to the need for this exception should be explained.

2. Project Objectives

Objectives established for the wetland project should be clearly stated in the management plan. They should include, at a minimum, a description of all new or enhanced beneficial uses which will comprise the net environmental benefit created by the project. Any desired, or "target" species (including wildfowl, shorebirds, fish, mammals, invertebrates, etc...), and the specific habitat requirements of these species, should also be listed and discussed.

3. Site Selection Factors

The site selection process should include a careful examination of all of the existing site features and conditions. The applicant should determine which agencies to contact in considering a wetland site. The following are examples of factors that should be considered when assessing the suitability of a site for the wetland:

a. Substrate - Important properties include soil type, permeability, texture, salt and nutrient content, and pollutant concentration.

b. Hydrology/Geomorphology - Issues which should be considered include source and supply of water, location within the watershed, ground water elevation and gradient, and existing surface water drainage patterns.

c. Vegetation - In choosing a site, the applicant should consider *in situ* vegetation, and the desirable and undesirable vegetation that may colonize the wetland.

d. Wildlife - Considerations should include the species which presently inhabit or visit the site, particularly the presence of endangered species.

e. Landscape and Land Use - The location of the site within the surrounding landscape should be examined. What long-term land uses are planned for this area? Would the wetland be compatible with local land uses and beneficial uses of nearby water bodies, including existing wetlands? What is the potential for human or domestic animal disturbances?

4. Site Sampling and Analyses

Initial sampling and analyses of the site sediments, soils, surface waters and/or ground water may be necessary to determine whether pollutants are already present at the site. The extent of sampling and type of analyses should be determined by the past uses of the site. Assessment of current conditions and site-descriptive sampling such as soil type and vegetation type should also be conducted.

5. Planning and Design Elements

The following are examples of elements that should be considered throughout the wetland design process.

a. Functions and Values - The necessary and desired functions and values of the wetland should be considered at the time the wetland is designed.

b. Wetland Type - The type of wetland to be created should be described. Wetland types include tidal salt marsh, tidal freshwater marsh, brackish marsh, freshwater marsh, and riparian wetland. Wetlands may also be seasonal or permanent.

c. Wetland Size - Adequate acreage will be needed to prevent formation of unplanned ponds in cases of large flows. Also, it is important that the applicant consider the proportion of treatment wetland versus the proportion of net environmental benefit wetland. This ratio will be examined by the Regional Board at the time the application is submitted for approval.

d. Physical Elements - Physical elements include bank slope and height, channels, berms, tide gates, pumps, and other water control structures, maintenance access, and overall site elevations and gradients.

e. Hydrology/Geomorphology - A good understanding of hydrology and geomorphology is critical in achieving goals associated with treatment and beneficial use attainment. The flow rate and capacity of the wetland should be designed to promote beneficial uses and/or treatment functions. Other factors to consider include drainage patterns, percolation rates, and the flow pattern through the system.

f. Water Quality - Anticipated water quality, including wetland influent and effluent, should be considered in the plan and design of the wetland. Water quality objectives must be met in any portion of the wetland that is designated a water of the United States. Although portions of the wetland that are treatment-only will not be subject to water quality objectives, a conservative approach should be used in the management of substances that biomagnify in the food chain (e.g. mercury, selenium, and organic pollutants) with attainment of water quality objectives as the goal of best management

practices. A liner should be considered in portions of the wetland that do not meet water quality objectives as well as an active program to discourage wildlife.

g. Vegetation - Vegetation goals should be established. The applicant must specify the how much wetland vegetation be from planted versus colonization from surrounding wetlands. The applicant should also determine how nuisance species will be controlled.

h. Wildlife - Wildlife goals should be established, and species which are expected to use the wetland should be identified. If endangered species are already present at the site, design modifications may be necessary, as determined by consultation with the U.S. Fish and Wildlife Service.

i. Vector Control - Vector control considerations should be discussed with the local vector control agency.

The management plan should contain maps of the proposed project. The maps should identify the treatment portion of the wetland and the portions where environmental benefits will be achieved.

6. Wetland Design Criteria

In order to better understand behavior of the wetland, future operators and regulators should be aware of the estimations and assumptions that were made during the design process. Therefore, it is recommended that all design values used in the design and construction be listed. Standard project design values that should be developed and listed in the facility plan include the initial and design years, design population, wastewater characteristics as prescribed in the NPDES permit established for the wetland, and hydraulic loading rates. Design values unique to wastewater wetlands - or which must be considered carefully in light of wetlands operations and functions - include operational water depth, calculated and measured (if available) detention times, and vegetation type, density and distribution.

B. OPERATIONS AND MAINTENANCE PLAN

Provision 11.B of the Resolution requires that the management plan include an operations and maintenance plan and contingency plans. The operations and maintenance plan should include a sequential listing of actions needed to ready the wetlands system and its personnel for operation once construction is completed. Matters such as staffing and training requirements, operations and maintenance procedures, contingency measures, reporting schedules, and laboratory testing should be considered in the plan. An operations and maintenance manual should be developed as a part of the plan. This manual should provide plant personnel with detailed instructions for assuring efficient operation and proper maintenance of all wetland components. Considerations that are unique to wastewater wetlands operation and maintenance, and which should be addressed in the operations and maintenance plan, are discussed below:

1. Vegetation Planting and Harvesting

The program for vegetation management should include a schedule for initial and follow-up plantings, the planting procedure to follow, and the criteria to determine whether a planting was successful. If vegetation harvesting will occur, a plan should be developed to identify the factors which will determine the necessity and frequency of harvesting, the harvesting procedures, and a program for disposal of harvested material. The impact of harvesting on

wildlife should be considered.

2. Channel and Bank Maintenance

A program for channel and bank maintenance in the wetland should include indicators for when maintenance is necessary, maintenance procedures, and a plan for disposal of any dredged material. If dredging or bank stabilization is necessary, the U.S. Army Corps of Engineers should be contacted to determine whether permitting is required under Section 404 of the Clean Water Act. The applicant should note that maintenance costs for sediment removal may be minimized if there is available land area for on-site disposal.

3. Pump and Gate Maintenance

A routine maintenance program should be developed for all mechanical devices necessary to the operation of the wetland. This program should ensure appropriate hydraulics are provided in order to maintain all wetland beneficial uses.

4. Vector Controls

A program for vector population monitoring and control should be developed with the local vector control agency and outlined in the management plan.

5. Contingency/Emergency Plans

a. Project Objectives Not Achieved: Guidance should be developed for procedures to follow if the intended beneficial uses are not realized, desired habitats are not established, or the desired species are not colonizing or utilizing the wetland.

b. Design Criteria Exceeded: The management plan should include measures for addressing temporary exceedences, as well as guidelines and options for addressing long-term or permanent exceedences. This includes cases where the wetland's storage or treatment capacity is exceeded due to unanticipated population growth or other factors.

c. Nuisance Conditions: Guidance should be outlined in the management plan for procedures to determine nuisance conditions, their causes, and the remedial actions necessary.

d. Toxicity Observed: A contingency plan should be developed in conjunction with the monitoring program in order to determine appropriate remedial actions if toxicity is determined to be present in wetland sediments or water.

e. Treatment Plant Failure: A contingency plan for protection of wetland habitat and wildlife should be developed in case of system bypasses or treatment plant failures. This plan should consider situations whereby the bypass or failure might result in toxic, hazardous, and/or nuisance materials being introduced into the wetland. The Regional Board strongly recommends auxiliary storage basins in cases of these emergencies. Emergency procedures developed for the wetland system should be incorporated into the emergency procedures of the treatment plant.

C. MONITORING PROGRAM

1. Policy Monitoring Requirements

Provision 11.C of the Resolution requires that the management plan contain a detailed monitoring program for parameters such as pollutants, habitat diversity, wildlife use and vector populations. Provision 7 specifically requires demonstration in the form of detailed monitoring that pollutants and other substances transferred to the wetland do not harm wildlife due to direct toxicity or bioaccumulation in the food chain. The discharger must also demonstrate that the wetland does not create vector problems, nuisance, or promote avian botulism or other infectious diseases.

2. Monitoring Recommendations

Physical and chemical monitoring requirements will be based on the nature of the effluent discharged to the wetland. Biological monitoring requirements will be based on both the nature of the discharged effluent and habitat goals for the site. The discharger should anticipate the presence of any toxic substances (or substances that bioaccumulate) in the wastewater that may exceed safe levels. In addition to water quality monitoring and biological monitoring, sediment samples should also be taken. Substances to be monitored, monitoring frequencies, and report requirements will be determined at the time the NPDES permit is issued for the site. In all cases, the sampling protocol should be well defined and described in the management plan. Detailed information about recommended monitoring follows:

a. Sediment - Sediments should be sampled periodically and analyzed for accumulation of metals, organics and other relevant constituents, with emphasis placed on sampling for the presence of toxic or bioaccumulative substances. Depth of sediments should be measured periodically to provide information for maintenance and operation of the wetland.

b. Water Column - Water column sampling requirements will be determined in the NPDES permit. Recommended sampling includes analyses for color, dissolved oxygen, BOD, pH, chlorine, nutrients, toxicity, pollutants of concern, and other relevant constituents. These analyses can provide insight into the general health of the wetland system, and will permit timely adjustments of system operations to maximize benefits and reduce potential hazards.

c. Flow Patterns - Occasional tracer studies are recommended to assess the effectiveness of the hydraulic design. Tracer studies can be used to identify and aid in the correction of unintended "short circuits" and "dead zones" in the wetland, in addition to providing estimates of residence times and turnover rates.

d. Vegetation - Vegetation sampling should include both chemical and physical sampling. Chemical sampling of plants should be used to assess nutrient and pollutant uptake rates, and to assess potential food chain risks to wildlife. Physical sampling such as seasonal vegetation mapping can be used to assess the achievement of optimal beneficial uses, and in maintenance planning.

e. Wildlife - Surveys of wildlife will help the discharger to determine the presence of target species and demonstrate that optimal beneficial uses are being achieved. Depending on the treatment plant effluent, toxicity testing and/or bioaccumulation studies may be necessary to verify that wildlife present in the wetland are not at risk. If it is determined

that there are hazards to wildlife present in the wetland, action must be taken to eliminate the hazards or to discourage wildlife use of the wetland.

f. Vector Control - Periodic monitoring of mosquitoes and any other nuisance insects should be a component of the required vector control program. Monitoring details should be addressed in connection with the local vector control agency.

D. WATER QUALITY IMPACT ASSESSMENTS AND PILOT WORK

Provision 11.D of the Resolution requires that the management plan include a complete description of any pilot work completed or other data collected in order to assess water quality impacts and the design and function of the wastewater wetland. The assessment of water quality impacts should include a description of anticipated water quality throughout the wetland system, including the quality of wetland influent and effluent.

III. Resources

A. INFORMATION SOURCES

1. Agencies

All agencies consulted in determining requirements and objectives for the project should be listed in the management plan. Names and phone numbers of contacts should be provided where possible.

2. Regulatory Requirements

Copies of orders, policies, or other regulations that apply to the project should be included in the management plan.

3. Publications

Publications or guidance materials used in the development of the management plan should be listed and available for reference.

B. REFERENCES

Regional Board staff recommend the following sources for further information and explanation:

1. *Habitat Mitigation and Monitoring Proposal Guidelines*, San Francisco District Corps of Engineers, 1991.

2. *Constructed Wetlands and Aquatic Plant Systems for Municipal Wastewater Treatment*, EPA Design Manual, U.S. Environmental Protection Agency, EPA/625/1-88/022, 1988.

3. *Wetland Restoration, Enhancement, or Creation*, U.S. Department of Agriculture, SCS Engineering Field Handbook, Chapter 13, 1992.

4. *Policy For Implementing The State Revolving Fund For Construction Of Wastewater Treatment Facilities*, State Water Resources Control Board, California Environmental Protection Agency, 93-2 CWP, January 1993.

5. *Guidance for Preparing a Facility Plan*, U.S. Environmental Protection Agency, MCD-46, revised May 1975.

6. *Model Facility Plan for a Small Community*, a Supplement to "Guidance for Preparing a Facility Plan," U.S. Environmental Protection Agency, September 1975.

7. *Facility Planning 1981, Municipal Wastewater Treatment,* U.S. Environmental Protection Agency, 430/9-81-002 FRD-20, Washington, D.C., March 1981.

8. *Manual For Assessing Restored and Natural Coastal Wetlands, With Examples From Southern Califorinia.* Sea Grant Report No T-CSGCP-021. Pacific Estuarine Research Laboratory, La Jolla, CA, 1990.